In re Application of: Ernest GRIMBERG
Serial No.: 10/567,438
Filed: February 7, 2006
Final Office Action Mailing Date: August 2, 2011

Examiner: Yara B. GREEN
Group Art Unit: 2884
Attorney Docket: **31322**
Confirmation No.: 5035

REMARKS

Reconsideration of the above-identified application in view of the amendments above and the remarks following is respectfully requested.

Claims 62-64, 66-72, 74, 76-81 and 84 are in this Application. Claims 62-64, 66-72, 74, 76-81 and 84 have been rejected under 35 U.S.C. § 103. Claims 1-61, 65, 73, 75 and 82-83 have been canceled in a previous response. Claims 62, 74 and 79 have been amended herewith.

Amendments To The Claims

35 U.S.C. § 103 Rejections

The Examiner rejected claims 62-64, 66-69, 71-72, 74, 76-80 and 84 as being unpatentable over US Pat. Appl. 2002/0074499 by Butler (hereinafter *Butler*) in view of US Pat. 5,994,701 by Tsuchimoto et al. (herein *Tsuchimoto*) and US Pat. 6,515,285 by Marshall et al (hereinafter *Marshall*). It is submitted in response that independent claims 62, 74 and 79, and the claims dependent thereon, are patentable, in the light of arguments set forth below.

For clarity, Applicants are describing the teachings of *Butler*, *Tsuchimoto*, *Marshall*, *Everest* and *Frey* individually but are traversing the rejection with respect to the combination of these references, *infra*. That is, the Applicants are not attacking the references individually, rather addressing the combinations of references as set forth in the instant Office Action.

The Examiner maintained the objections of the previous Office Action dated February 25, 2011. The Examiner states that the amendments made do not preclude

the prior art from including additional components, such as *Tsuchimoto*'s lens 1b, between the shutter and the detector.

While disagreeing with the rejections, in order to expedite prosecution Applicant hereby amends independent claim 62 to state:

> 62. An infra-red imaging camera comprising:
>
> an uncooled and unshielded detector comprising an array of infra-red (IR) sensors arranged to detect infra red radiated energy, said array comprising a plurality of IR sensors,
>
> a non-uniformity corrector, associated with said detector, operable to perform non-uniformity correction on outputs of said array to provide uniform outputs having a uniform response to energy detected at said uncooled sensor, ~~and~~
>
> a calibrator to carry out periodic calibration operations by taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter, and to derive a reference temperature from said at least one calibration temperature measurement, said reference temperature being a temperature indicative of radiated energy not from an external scene, and a reference level comprising an average video signal of said IR sensors at the time of said calibration temperature measurement, said average being taken over said plurality of IR sensors, and to calculate a temperature of objects in said camera's field of view for each of said plurality of IR sensors from a difference between a respective uniform output of said sensor and said reference level, said temperature being calculated using a same signal to temperature function for each of said sensors, wherein said reference temperature is an offset of said function, and
>
> focusing optics configured for gathering infra-red energy from an external scene, said focusing optics being entirely located to define an optical unit;
>
> wherein said shutter is positioned between said optical unit ~~optics of said camera~~ and said detector. (Emphasis added.)

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Corresponding amendments have been made to independent claims 74 and 79. Support is found *inter alia* on p. 15 lines 21-25 and Fig. 1 of the instant specification.

Independent claims 62, 74 and 79 are hereby amended to state that camera focusing optics which admit the IR energy define an optical unit. The shutter (and with it the temperature sensor) is positioned between optical unit and the detector.

In contrast with the claimed embodiments, *Tsuchimoto*'s optics which admit the external IR radiation includes two lenses, lenses 1a and 1b. IR radiation from the external scene must pass through both of these lenses in order to be incident upon the infrared sensor. *Tsuchimoto* col. 7 lines 43-45 define infrared component A which is detected by the IR sensor to comprise:

> infrared rays passed through the lens aperture (i.e., the aperture of the aperture stop 4) and converged through the optical system to be incident on the infrared sensor 6.

Applicant respectfully notes that **focusing optics** serve to converge the input light on the detector. Therefore in *Tsuchimoto* both lenses 1a and 1b together serve as the focusing optics.

As seen in Fig. 1, *Tsuchimoto's* positions shutter 3 and sensor 5 between lenses 1a and 1b, that is within the optical unit. Thus *Tsuchimoto* does not include "*focusing optics configured for gathering infra-red energy from an external scene, said focusing optics being entirely located to define an optical unit; wherein said shutter is positioned between said optical unit and said detector*".

The Examiner has agreed that *Butler* does not teach a separate function that corrects the object temperature by incorporating a sensor on the shutter, rather *Butler* uses the shutter information to correct non-uniformities amongst detector elements. The Examiner agrees that *Tsuchimoto* does not explicitly disclose implementing an average video signal of the sensor array. The Examiner cites *Marshall* as including these features.

As discussed in the previous response, in *Tsuchimoto* the signal obtained from the shutter temperature sensor does not compensate for:

1) The difference in optics transmittance;
2) The difference in the spectral band; and
3) The difference on the numerical aperture (F#).

The shutter also significantly changes the additional energy collected by the IR detector from the surrounding internal camera parts.

The deficiencies encountered by IR cameras which position the shutter outside the optical unit, as claimed herein, cannot be corrected by *Tsuchimoto*. In *Tsuchimoto* the shutter temperature does not accurately reflect all the impinging IR radiation from the surroundings. Utilizing *Marshall*'s offset in *Tsuchimoto*'s calculations for an IR camera with a shutter inside the optical unit will lead to inaccuracies, due to a failure to compensate for differences in F#, optical element transmittance and spectral band.

In summary, neither *Butler* nor *Tsuchimoto* nor *Marshall*, alone or in combination, disclose "*a calibrator...taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter, and to derive a reference temperature from said at least one calibration temperature measurement, said reference temperature being a temperature indicative of radiated energy not from an external scene...and focusing optics configured for gathering infra-red energy from an external scene, said focusing optics being entirely located to define an optical unit; wherein said shutter is positioned between said optical unit and said detector*". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall*, alone or in combination, disclose all the limitations of claims 62, 74 and 79.

Applicant respectfully believes that the Examiner's objections are overcome by the present amendments.

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It is believed that the dependent claims are allowable as being dependent on an allowable main claim. The specific objections against the dependent claims are therefore not responded to individually.

The Examiner rejected claim 70 as being unpatentable over *Butler* in view of *Tsuchimoto* and *Marshall*, and further in view of US Pat. 4,907,895 by Everest (herein *Everest*). It is submitted in response that claim 70 is patentable in the light of arguments set forth below.

The Examiner states that *Everest* teaches coating at least part of the internal side of a shutter so that it is highly reflective to the infrared radiation generated by the shutter, and that it would be obvious to a person skilled in the art to apply this to *Butler* as modified by *Tsuchimoto* and *Marshall*. Utilizing *Everest*'s reflective shutter in *Tsuchimoto* would result in a reflective shutter positioned between within the optical unit (i.e. between *Tsuchimoto*'s lens 1a and lens 1b). Neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Everest*, alone or in combination, disclose "*a calibrator...taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter, and to derive a reference temperature from said at least one calibration temperature measurement, said reference temperature being a temperature indicative of radiated energy not from an external scene...and focusing optics configured for gathering infra-red energy from an external scene, said focusing optics being entirely located to define an optical unit; wherein said shutter is positioned between said optical unit and said detector*". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Everest*, alone or in combination, disclose all the limitations of claim 70.

It is therefore submitted that claim 70 is both novel and inventive over the cited prior art.

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The Examiner rejected claim 81 as being unpatentable over *Butler* in view of *Tsuchimoto* and *Marshall*, and further in view of US Pat. 5,925,875 by Frey (herein *Frey*). It is submitted in response that claim 81 is patentable in the light of arguments set forth below.

The Examiner states that *Frey* teaches using a high pass filter in conjunction with a focal plan array in order to remove unwanted temporal noise and fixed pattern noise components of an image signal, and that it would be obvious to a person skilled in the art to apply this feature to the method of *Butler* as modified by *Tsuchimoto* and *Marshall*. Utilizing Frey's high pass filter in *Tsuchimoto* would leave the position of the lens within the optical unit unchanged. Thus neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Frey*, alone or in combination, disclose "*a calibrator...taking at least one calibration temperature measurement of a temperature of a shutter of said camera while said shutter is closed, using a first temperature sensor located on said shutter, and to derive a reference temperature from said at least one calibration temperature measurement, said reference temperature being a temperature indicative of radiated energy not from an external scene...and focusing optics configured for gathering infra-red energy from an external scene, said focusing optics being entirely located to define an optical unit; wherein said shutter is positioned between said optical unit and said detector*". Thus neither *Butler* nor *Tsuchimoto* nor *Marshall* nor *Frey*, alone or in combination, disclose all the limitations of claim 81.

It is therefore submitted that claim 81 is both novel and inventive over the cited prior art.

Conclusion

In view of the above amendments and remarks it is respectfully submitted that claims 62-64, 66-72, 74, 76-81 and 84 are now in condition for allowance. A prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

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Enclosures:

- Request for Continued Examination (RCE)